CLAIMS

What is claimed is:

1. A method of applying a drug-polymer coating on a stent, comprising:

dipping a stent framework into a first polymeric solution, wherein the first polymeric solution comprises a first polymer, a first therapeutic agent, and a first solvent;

forming a thin drug-polymer layer on the stent framework, wherein the first polymeric solution is dried and wherein the first polymer is cured; and

repeating the steps of dipping the stent framework into the first polymeric solution and forming the thin drug-polymer layer until a target thickness of the drug-polymer coating with the thin drug-polymer layers is disposed on the stent framework.

2. The method of claim 1 wherein the first polymeric solution comprises a first polymer including a low molecular weight silicone oil, a cross-linking agent, and a catalyst.

3. The method of claim 2 wherein the cross-linking agent comprises tetrapropylorthosilicate.

4. The method of claim 2 wherein the catalyst comprises stannous octoate.

5. The method of claim 1 wherein the first polymeric solution comprises a first monomer including poly acrylic acid, a second monomer including vinyl pyrollidone, and an initiator.

6. The method of claim 5 wherein the initiator comprises benzophenone.

7. The method of claim 1 wherein the first polymeric solution comprises between 0.05 percent and 3.0 percent total solids by weight of the first polymer.

8. The method of claim 1 wherein the first therapeutic agent is selected from the group consisting of rapamycin, a rapamycin derivative, a rapamycin analogue, camptothecin, dexamethasone, 5-fluorouracil, a bioactive agent, a pharmaceutical drug, a therapeutic substance, and a combination thereof.

9. The method of claim 1 wherein forming the thin drug-polymer layer comprises drying the first polymeric solution and curing the first polymer with ultraviolet light.

10. The method of claim 1 wherein forming the thin drug-polymer layer comprises drying the first polymeric solution and curing the first polymer with one of thermal activation, electrical activation, or ionizing irradiation.

11. The method of claim 1 further comprising:

adding an ultraviolet-sensitive catalyst into the first polymeric solution prior to dipping the stent framework into the first polymeric solution.

12. The method of claim 1 further comprising:

adding one of an initiator or a crosslinking agent into the first polymeric solution prior to dipping the stent framework into the first polymeric solution.

13. The method of claim 1 further comprising:

dipping the stent framework including the formed thin drug-polymer layer into a second polymeric solution, wherein the second polymeric solution comprises a second polymer and a second solvent;

forming a thin barrier layer on the formed thin drug-polymer layer, wherein the second polymeric solution is dried and wherein the second polymer is cured; and

repeating the steps of dipping the stent framework into the first polymeric solution and forming an additional thin drug-polymer layer, and dipping the stent framework including the additional thin drug-polymer layer and forming the thin barrier on the thin drug polymer layer, until a target thickness of the drug-polymer coating with the thin drug-polymer layers and the thin barrier layers is disposed on the stent framework.

14. The method of claim 13 wherein the second polymeric solution comprises a second therapeutic agent.

15. The method of claim 14 wherein the second therapeutic agent is selected from the group consisting of rapamycin, a rapamycin derivative, a rapamycin analogue, camptothecin, dexamethasone, 5-fluorouracil, a bioactive agent, a pharmaceutical drug, a therapeutic substance, and a combination thereof.

16. The method of claim 1 further comprising:

modulating a concentration of the first therapeutic agent in the thin drug-polymer layers to provide a predetermined drug-release profile.

17. A drug-polymer coated stent, comprising:

a stent framework; and

a laminated drug-polymer coating disposed on the stent framework, the laminated drug-polymer coating including a plurality of thin drug-polymer layers, wherein the thin drug-polymer layers include a first therapeutic agent and a cured first polymer.

18. The stent of claim 17 wherein the stent framework comprises one of a metallic base or a polymeric base.

19. The stent of claim 17 wherein the stent framework comprises a material selected from the group consisting of stainless steel, nitinol, tantalum, MP35N alloy, platinum, titanium, a chromium-based alloy, a suitable biocompatible alloy, a suitable biocompatible material, a biocompatible polymer, and a combination thereof.

20. The stent of claim 17 wherein the first therapeutic agent is selected from the group consisting of rapamycin, a rapamycin derivative, a rapamycin analogue, camptothecin, dexamethasone, 5-fluorouracil, a bioactive agent, a pharmaceutical drug, a therapeutic substance, and a combination thereof.

21. The stent of claim 17, wherein a concentration of the first therapeutic agent is modulated to provide a predetermined drug-release profile.

22. The stent of claim 17 further comprising:

at least one thin barrier layer positioned between one or more thin drug-polymer layers, wherein the thin barrier layer includes a cured second polymer.

23. The stent of claim 22 wherein the thin barrier layer includes a second therapeutic agent.

24. The stent of claim 23, wherein the second therapeutic agent is selected from the group consisting of rapamycin, a rapamycin derivative, a rapamycin analogue, camptothecin, dexamethasone, 5-fluorouracil, a bioactive agent, a pharmaceutical drug, a therapeutic substance, and a combination thereof.

25. A system for treating a vascular condition, comprising:

a catheter; and

a coated stent coupled to the catheter, the coated stent including a stent framework and a laminated drug-polymer coating disposed on the stent framework, the laminated drug-polymer coating including a plurality of thin drug-polymer layers, wherein the thin drug-polymer layers include a first therapeutic agent and a cured first polymer.

26. The system of claim 25 wherein the catheter includes a balloon to expand the stent.

27. The system of claim 25, wherein the catheter includes a sheath that retracts to allow expansion of the stent.

28. The system of claim 25 wherein the stent framework comprises one of a metallic base or a polymeric base.

29. The system of claim 25 wherein the stent framework comprises a material selected from the group consisting of stainless steel, nitinol, tantalum, MP35N alloy, platinum, titanium, a chromium-based alloy, a suitable biocompatible alloy, a suitable biocompatible material, a biocompatible polymer, and a combination thereof.

30. The system of claim 25 wherein the first therapeutic agent is selected from the group consisting of rapamycin, a rapamycin derivative, a rapamycin analogue, camptothecin, dexamethasone, 5-fluorouracil, a bioactive agent, a pharmaceutical drug, a therapeutic substance, and a combination thereof.

31. The system of claim 25 wherein a concentration of the first therapeutic agent is modulated to provide a predetermined drug-release profile.

32. The system of claim 25 further comprising:

at least one thin barrier layer positioned between one or more thin drug-polymer layers, wherein the thin barrier layer includes a cured second polymer.

33. The system of claim 32 wherein the thin barrier layer includes a second therapeutic agent.

34. The stent of claim 33, wherein the second therapeutic agent is selected from the group consisting of rapamycin, a rapamycin derivative, a rapamycin analogue, camptothecin, dexamethasone, 5-fluorouracil, a bioactive agent, a pharmaceutical drug, a therapeutic substance, and a combination thereof.

35. A method of treating a vascular condition, comprising:

inserting a drug-polymer coated stent within a vessel of a body, the drug-polymer coated stent including a laminated drug-polymer coating having a plurality of thin drug-polymer layers, wherein the thin drug-polymer layers include at least one therapeutic agent and a cured first polymer; and

eluting at least one therapeutic agent from the laminated drug-polymer coating into the body.

36. The method of claim 35 wherein the drug-polymer coated stent includes at least one thin barrier layer positioned between one or more thin drug-polymer layers, wherein the thin barrier layer includes a cured second polymer.

37. The method of claim 36 wherein the thin barrier layers control an elution rate of at least one therapeutic agent.

38. The method of claim 36 further comprising:

selecting the cured first polymer and the cured second polymer based on a predetermined elution rate of at least one therapeutic agent.